sink.

13. The vacuum chamber according to claim 12 wherein said coil is made of copper.

14. The vacuum chamber according to claim 12 wherein said gas inlet source is made of sapphire.

REMARKS

A clean copy of the specification as corrected and the claims as amended are presented hereinabove. A copy of the specification and claims using brackets to delete material and underlines to add material to the specification and claims is attached hereto.

The claims are 1-14. The claims have been amended to change "A" to "The" for claims 2-11 and 13-14. The claims have also been amended to overcome the rejections under 35 USC 112. Applicants submit the claims as amended overcome these rejections.

Claims 1-2 and 6-11 have been rejected as unpatentable under 35 USC 103 over Hao et al '775. This rejection is respectfully traversed.

Hao cools or reduces the temperature difference between a support heat sink and an electrode heated showerhead using heat transfer members between them. The heat transfer members are

thermally conductive parts/gaskets/rings placed at the center or along a plane to heat sink heat from the showerhead. These heat sink parts can be baffle plates, cut-outs which fit into grooves, or conductive items in a gas distribution chamber. These heat sinks are solid, non-compressible metal or dielectric parts, rather than the compressible, multiple turn coil required by the claims. In no case is the thermal sink a compressible unit.

The present multiple turn coil heat sink has several advantages over the heat sources and heat sinks of Hao; it can extend all along and between heat source and heat sink surfaces for a uniform heat transfer between the two. The compressive coil has another advantage; by being compressible, a tight fit of the coil to the heat source and the heat sink surfaces ensures rapid and uniform heat transfer.

The three rings of Hao shown in Fig. 4 are designed to cover a minimum amount of the surface of the showerhead electrode; they are concentric but not compressible, and no multiple coil turns are shown or suggested, as required by the present claims. The Examiner states it would be obvious to substitute a compressible coil for the non-compressible parts of Hao, but without any showing that one skilled in the art would do so; certainly Hao,

presumably one skilled in the art, although he gives several examples of heat sink parts, did not do so. Applicants submit that this rejection is based solely on hindsight, which is improper. The requirement of compressibility of the present heat sink is significant; it provides a tight fit under any temperature change, independent of any expansion or contraction of the chamber parts due to rapid changes of temperature.

The Examiner also points particularly to claim 2, which requires that the heat sink surround the thermal source, not found in Hao et al either.

The Examiner also refers to claim 6, which requires that the coil be of copper; it is conceded that copper is well known for its thermally and electrically conductive properties. However, this claim is dependent upon claim 1 and is patentable for the same reasons as is claim 1.

Claims 8-11 require additional features, i.e., that the heat sink and heat source be concentric, also not suggested by Hao et al; that the heat sink be grooved to accommodate a compressive coil, also not suggested by Hao et al; that the heat sink also include a means of cooling, not suggested by Hao et al; and that the thermal coil fill the space between the thermal source and

the thermal sink. In no case does Hao et al fill the space between the manifold electrode support and the manifold. Thus applicants submit the present claims require features not shown nor suggested by Hao et al, and that have a unique ability to heat sink rapidly and uniformly because of its compressibility feature.

The Examiner points to claim 7, which requires a small size coil of copper wire. This small size provides good compressibility, which feature is notably missing from the heat sink parts of Hao et al.

Claims 1-14 have also been rejected as unpatentable under 35 USC 103 over Herchen in view of Hao et al. This rejection is also respectfully traversed.

Herchen discloses inserting parallel sapphire tubes into a sleeve, leaving a gap which is filled with an IR absorbing fluid, but a fluid that is not microwave absorbing. The fluid flows between the outer sapphire tube and the sleeve.

Thus Herchen discloses the problems of cooling a plasma exposed sapphire tube or tubes, but solves the problems using a coolant fluid to cool the sapphire. This is quite different from the present means of cooling using a compressible, heat

conductive coil.

Hao uses various conductive units to cool tubing; either conductive shaped units; or concentric rings; or notched pieces that allow coolant gases to flow between a heated showerhead and a support member. Hao does not disclose or suggest a compressible coil as the heat sink at all.

Thus neither of these references disclose or suggest the use of a compressible coil to provide heat sinking to a heated sapphire tube or anything else.

Applicants submit the Examiner is reading "compressible" and "coil" into the prior art disclosures, which can only be done by using hindsight based on applicants' own disclosure, which has long been held to be improper.

The Examiner in his rejections uses the term "coil", but Hao discloses at best a plurality of concentric rings, notch-mating pieces, or shaped solids to provide heat sinking. Neither of the references disclose a coil, nor compressibility of the heat sinks described at all. The advantages of the present solution have been detailed hereinabove.

Thus applicants submit the present claims are patentable over the references, and, in view of the amendments to the

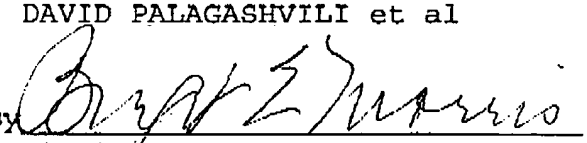
claims, they are now in condition for allowance. Accordingly, reconsideration and allowance of the claims are respectfully solicited.

If the Examiner believes a telephone interview would advance the prosecution of this application, he/she is invited to contact the undersigned.

A Petition for an extension of the term for response to the office action accompanies this paper. The Petition fee is charged to Deposit Account 13-4542.

Respectfully submitted,

DAVID PALAGASHVILI et al

By 

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Docket No. AM3137

SPECIFICATION AS AMENDED

The present conductive coil 40 of the invention thus can be placed between the sapphire tubing 30 and the ceramic tubing 38 to rapidly transfer thermal energy away from the sapphire tube 30. In the embodiment shown in Fig. [2] 3, the dielectric ceramic tubing 38 has grooves 42 cut into the surface facing the sapphire tube to accommodate the conductive coil 40. Since the conduct8ive and compressible coil 40 expands to fit the space between the sapphire tube 30 and the ceramic tuve 38, tight contact between the two tubes is maintained, so that rapid thermal transfer from the inner sapphire tube 30 to the outer ceramic tube 38 is assured.

Docket No. AM3137

THE CLAIMS AS AMENDED

1 (amended). A thermal transfer device comprising a thermal source maintained in parallel to a thermal sink and having a thermally conductive, compressible, multiple coil between [them] the thermal source and the thermal sink.

2 (Amended). [A] The thermal transfer device according to claim 1 wherein the thermal sink surrounds the thermal source.

3 (Amended). [A] The thermal transfer device according to claim 1 wherein said thermal source is made of a dielectric material.

4 (Amended). [A] The thermal transfer device according to claim 3 wherein said thermal source is made of sapphire.

5 (Amended). [A] The thermal transfer device according to claim 1 wherein said thermal sink is made of a dielectric material.

6 (Amended). [A] The thermal transfer device according to claim 1 wherein said thermally conductive coil is made of copper.

7 (Amended). [A] The thermal transfer device according to claim 6 wherein said copper coil is made from copper wire about 0.011 inch thick.

8 (Amended). [A] The thermal transfer device according to claim 1 wherein the thermal source and the thermal sink are concentric.

9 (Amended). [A] The thermal transfer device according to claim 9 wherein the [outer wall] surface of the thermal sink [facing the thermal source] is grooved to accommodate the compressive coil.

10 (Amended). [A] The thermal transfer device according to claim 2 wherein the thermal sink includes a means of cooling.

11 (Amended). The thermal transfer device according to claim 1 wherein the conductive, compressible, multiple turn coil fills the [gap] space between the thermal source and the thermal sink.

[14] 12. (Amended). [A] The In a vacuum chamber comprising a processing chamber including a substrate to be processed, a processing gas inlet source that traverses a microwave energy source for forming a plasma from [the] a processing gas, the improvement comprising

a microwave impervious gas inlet made of a dielectric material in the form of a tube that provides a thermal source, the dielectric tube surrounded by a concentric dielectric tube that provides a thermal sink, and a compressible, conductive multiply turn coil between [them] the thermal source and the thermal sink.

13 (Amended). [A] The vacuum chamber according to claim 12 wherein said coil is made of copper.

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14 (Amended). [A] The vacuum chamber according to claim 12 wherein said gas inlet source is made of sapphire.